



January Monthly Math Challenge
Middle School Level
Problem & Solution

Instructions: TEAMS coaches submit student answers to the question(s) below using the submission link on the TEAMS website. All submissions must be made during the month of January. Those submissions with correct answers will be entered into a drawing for a \$25 Visa gift card, which will be sent to the student in care of the TEAMS coach.

Trail Design

As an engineer working on a new trail development project, you have been tasked to provide design support on the trail development team. The team is developing a corridor trail that will be composed of crushed limestone. The trail requires a width of 8 feet and a limestone base of 3 inches. The total length of the trail is 1500 feet. You have been tasked with ordering the crushed limestone from the local quarry. If each dumptruck load can carry 25,000 pounds of crushed limestone and 1 cubic yard of crushed limestone weighs 2,750 lbs, how many dumptruck loads of crushed limestone will be required for the trail?

Solution

Answer: 13 truckloads

First determine the volume of crushed limestone needed for the trail

Trail length = 1500 ft

Trail width = 8 ft

Trail depth = 3 inches $\times \frac{1 \text{ ft}}{12 \text{ inches}} = 0.25 \text{ ft}$

Volume = length \times width \times depth = 1500 ft \times 8 ft \times 0.25 ft = 3,000 ft³

Next convert material volume from ft³ to cubic yards (yd³)

$$3000 \text{ ft}^3 \times \frac{1 \text{ yd}^3}{27 \text{ ft}^3} = 111 \text{ yd}^3$$

Next determine the volume of material that can fit in the dump truck

$$\frac{25,000 \text{ lbs}}{1 \text{ dump truck}} \times \frac{1 \text{ yd}^3 \text{ crushed limestone}}{2,750 \text{ lbs crushed limestone}} = \frac{9.09 \text{ yd}^3 \text{ crushed limestone}}{1 \text{ dump truck}}$$

Finally, divide the material volume needed by the amount that can fit in one dump truck

$$111 \text{ yd}^3 \times \frac{1 \text{ dump truck}}{9.09 \text{ yd}^3} = 12.2 \text{ trucks}$$

Therefore, 13 dump truck loads will be required to deliver the crushed limestone.